

Scientific American.

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Steam Propulsion—Crank and Paddle Wheel.

The last number of *Hunt's Merchants' Magazine* contains an article on the above subject, by H. Boynton, of this city. It is written with much ability, and its tenor is to show that there is an immense loss of power by the oblique actions of the crank and the paddle wheel in steamships. This loss is stated to be about 21 per cent in the crank, and over 55 per cent in the paddle wheel, thus making a total loss of 76 per cent of the steam power exerted on the piston. It is asserted that nearly all this waste of power can be saved by a new system, called "the reciprocating railway oar-truck, parallel propulsion." What this system is remains yet to be shown, as it is not clearly described. Wrong notions are entertained by many persons in reference to the loss of power by the use of the crank, and we consider this a good opportunity of expressing our views upon this subject for the benefit of the general reader.

Our acquaintance with the crank, and an investigation of its properties, led us long since to the conclusion that it occasions no loss of power by oblique action, and that it is the most beautiful compensating device ever devised for converting reciprocating into rotary motion. Owing to a misapprehension of its action, innumerable substitutes have been devised for it, but they have all yielded to its superiority, even the "sun and planet" motion of the unequalled Watt.

The crank is simply a lever or crooked arm, a well-known device, used from the most ancient times to convert rotary into reciprocating rectilinear motion, and *vice versa*. Connected with the piston rod of a steam engine, and the rotary paddle shaft of a steamer (either united with a walking beam or not), the crank and paddle wheel make a revolution while the piston makes one movement forward and another backward in the cylinder. The crank is in length the radius of the circle it describes, or one-half the length of a single stroke of the engine. It therefore has a definite relative velocity to that of the piston, which is as 100 to 63. For example, while the piston moves through a space of 63 inches, the crank pin moves over a space of 100 inches. It is oblique in its action to be sure, in relation to the direction of the piston, but this involves no loss of power, because its greater velocity makes up the difference. Thus allowing the piston of an engine to have an area of 100 square inches, a pressure of 100 pounds on the square inch, and a double stroke of 63 inches, the power will be 10,000 pounds moved through a space of five feet three inches. If the oblique action of the crank is measured, while the piston makes a double stroke, the pressure on the crank pin will only be 63 pounds to the square inch to each interval of space passed over—37 pounds less than the pressure on the piston. This consideration has led many persons to believe that there is thus a great loss of power in the use of the crank. But as 63 pounds pressure on a crank pin moving over a space of 100 inches is exactly equal to 100 pounds on the piston moving 63 inches, there can be no loss of power in such a case. The relative velocity of the piston to that of the crank is as the spaces passed through, namely, 2 R to 3.1415 (very nearly), or 63 to 100.

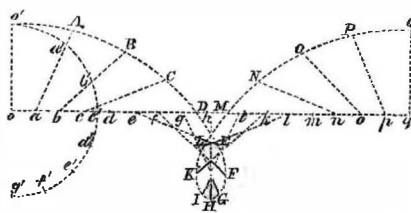
Many persons have entertained the notion that a machine could be made to generate its own power; in other words, a "perpetual motion." The idea that a machine can destroy its power independent of the friction of its rubbing surfaces, by oblique action, is but the converse of a perpetual motion; the one is just as correct as the other. Power may be transferred but not annihilated in a machine. There are rectilinear and there are crank Cornish pumping engines, and the latter are

just as efficient as the former, thus showing that the crank does not destroy the power. A fair test of some of these engines has developed the fact that they gave out to within 10 per cent of the steam power applied, and when this amount of friction is allowed for the whole of the engine, it is impossible that more than two or three per cent was taken up by the crank.

The crank has two dead points in the revolution. This has been held to be a great objection to it; but at these points it does not waste power, because the piston is then at the end of its stroke, and therefore not consuming steam. As the movement of a piston back and forth in a cylinder requires it to be arrested and again set in motion, at the end and beginning of every stroke, this would be liable to produce a series of concussions, and great irregularity of motion were it not for the crank. Its greater velocity converts the irregular motion of the steam on the piston into one of great uniformity; it sweeps smoothly and gracefully past the dead points, especially when aided by a fly wheel, or its substitute, and involves no loss of power by its oblique action. From its nature and mode of action it performs the office of a conveyor and regulator of power.

Mr. Boynton is right in stating that there is a great loss by slip in paddle wheels, but in smooth water, with a uniform submerged section of vessel, fifteen, not "fifty-five," is allowed to be the general slip of steamboats. Thus showing that it is not the oblique action of the paddle wheel, which may be the cause of such a great amount of slip in steamships, as he asserts. Ocean steamers do not afford a true test of the real amount of slip. Owing to head winds, rough seas and heavy cargos the slip varies from 15 to 75 per cent. In severe head winds, even when the engines and paddle wheels are kept in continued motion, it is sometimes impossible for steamers to make any forward progress, the whole of the paddle wheel action is then converted into slip, but this is not owing to their oblique action. Scott Russell, in his work on steam navigation, presents the accompanying illustration of the action of the paddle wheel while a vessel is in motion, to show that there is not much if any loss of power by *concussion* and *lift* as the paddles enter and leave the water.

The phenomena of a paddle wheel revolving on a steamboat when the vessel is in motion differs essentially from that exhibited when the wheel revolves and the vessel is standing still, as is rendered clear by this diagram. Commencing at the point, *a*, with the wheel turning on a stationary shaft, the paddle would come successively into the positions, *a' b' c' d' e' f' g'*, but by the shaft advancing forward (as the boat is moved) into the posi-



tions, *ab cd*, &c., the paddle describes a path in reference to the water which is the result of both motions, and the successive positions it occupies are *a A, b B, c C*, &c. The paddle describes trachoidal curves; it is inserted into the water in an angular position closely resembling that of an oar; then it acts horizontally for a short period, after which it is withdrawn from the water edgewise, in an easy and elegant manner, which a dexterous rower might try to equal, but which he could hardly excel.

Innumerable devices have been invented to remedy the supposed evils of existing paddle wheels, but none of them have succeeded. Mr. Boynton may have invented a new and useful improvement in steam propulsion, but he has over-estimated the loss of power by the crank and paddle wheel. The screw propeller, taking all things into consideration,

appears to be the prince of propelling devices yet brought forward, and it remains to be demonstrated whether it or the paddle wheel will be superseded by "the reciprocating railway oar-truck, parallel propulsion."

The New York Evening Post and the Scientific American.

The *New York Evening Post* of the 24th ult. says:—

"The logic of the SCIENTIFIC AMERICAN is not always as good as its science, and its attention to the theories of its contemporaries not always as respectful as to the patent theories of its clients. With no disposition to disparage the general ability or fairness of the SCIENTIFIC AMERICAN, we desire to remind it of the following instance of palpable misrepresentation, which was doubtless unintentional:

EVENING POST. SCIENTIFIC AMERICAN.  
"The difficulty of 'The New York Evening Post,' of the 6th idly depends on circumstances connected with the cable itself, and Ocean Telegraph is not not on the instruments; due to the instruments, and this is the point to but to the cable itself, which we invite the *This is not a new idea*, electricians' attention, although it is put forth as 'Let it be borne in such.'"

mind that we are now urging a well known law and, therefore, familiar, we presume, to all the electricians engaged on the cable."

We have no desire to misrepresent our contemporary, the *Evening Post*, and we are somewhat surprised that a journal of its acknowledged ability and probity should have resorted to mere quibbles in order to blunt the force of our reasoning upon the "Science of Ocean Telegraphing." Our "logic," it says, "is not always as good as our science." Well, let us see. Looking squarely at the above parallel passages, it would seem perfectly clear that we had misrepresented the *Post*; but instead of this being the fact, we think that we can show that the *Post* has not only misrepresented itself, but has placed us in a false position before its intelligent readers. It has misquoted its own language in a most important particular, by omitting a whole sentence immediately after the words, "electricians' attention." The writer continues as follows: "No increase of power will influence the velocity, for the latter is determined by the former." Now, in our opinion, *this* omitted sentence contains the law which the writer declares to be so well known, and the whole subsequent part of the long article confirms our judgment. It seems to us preposterous to call "circumstances connected with the cable" a well-known law. If we understand language, these "circumstances" could not properly receive such an appellation. How can the editor of the *Post* argue out that a circumstance is a well-known law? We have the authority of Doctor Johnson that it is "an adjunct of a fact," while a law is a fact itself—the cause or principle from which circumstances proceed. If our misrepresentation is so "palpable," why did the *Post* omit the quotation upon which our remarks are founded?

Possibly we may have mistaken the writer's position in reference to the novelty of the cable idea. He invited the electricians' attention to it, and this fact impressed us that he thought it was new. If this is the law he supposed was so familiar to all electricians engaged on the cable, it is almost ridiculous to suppose that they needed to have their attention invited to it.

Fair of the American Institute.

The Thirtieth Annual Fair of the American Institute was opened to the public on the evening of the 21st ult. Judge Meigs made the usual inaugural address, and gave a very clear and succinct history of the annual exhibitions of this institution, setting forth their objects, namely, the encouragement and improvement of American manufactures and productive industry. The opening of the Fair had been postponed for a week, to allow exhibitors further time to bring forward their

articles, take up their positions, and permit of a better general arrangement at the opening than had been usual on like occasions previously. We regret to state that the exhibitors have been rather dilatory in coming forward, but at the time of our going to press, great activity is beginning to be manifested, and a very good Fair is in prospect.

The show of agricultural implements is the largest and best that has ever taken place, and so is that of the various fruits. It will be an instructive and entertaining Fair to our farming population. We intend to give this department—agricultural machinery—particular attention, and notice all improvements deserving special attention.

The show of tools, lathes, screw machines, &c., promises to be excellent. There are two lines of shafting for driving machinery, and every facility is afforded for a good display of mechanism. We will not take up space at present in generalizations, as in future numbers we will enter into particulars. The exhibition will continue until the end of October.

The Atlantic Telegraph.

The Ocean Telegraph is a marine hobgoblin. After condescending to pass compliments between "Her Majesty the Queen" and "His Excellency President Buchanan" upon the success of that event which cost our citizens so much powder and puffing, he grew sulkily silent, and for three whole weeks refused to do a single bit of the business for which he was engaged. A story was set on foot by that old electric eel, Professor Whitehouse, to the effect that this water wizard had become cracked on one of his Irish adventures, and that his keepers had refused to attend to his case, when lo! out he pops from his submarine cave at Newfoundland on the 22d ult., and declared in the most indignant terms that he was neither cracked nor constipated, but had been taking a long and necessarily refreshing snooze, after the severe labor of carrying such weighty responsibilities for two whole days as the messages (consisting of 158 words) of the two greatest dignitaries of the Old and New Worlds. Like Richard, he was "himself again," wide awake, and would be ready, in the very short period of other three weeks, to do the entire "lightning express" business between John Bull and his promising descendant, Brother Jonathan.

The matter being thus fairly understood, the old fellow took another notion into his head, and on the very next day (the 23d) he declared that it was not him who had spoken on the previous day, but some other fellow for him. He stated he had not waked up yet, and could not tell when he would—the lazy old porpoise. We hope "King Cyrus" will soon give him another field day, and put him through his regimental facings. It is our opinion that he is too slow in his motions to do business for the descendants of the Flying Dutchman. We recommend that he be "ringed down" according to the enlightened proposition of our worthy cotemporary the *Evening Post*.

The Period of Life subject to Insanity.

The *London Lancet* says that to determine the period of life which furnishes the greatest number of insane persons, it is sufficient to bring together the records, made up under different circumstances. One of these, made at the Bicetre, France, where poor men only are received; another at the Salpetriere, a hospital for poor women; the third, an establishment devoted to the wealthy, have been examined, and it appears that the age which furnishes the greatest number of insane is, for men, that from thirty to forty years, while for women it is that from fifty to sixty years. The ages which furnish the least, for both sexes, are childhood, youth, and advanced age. Among women insanity generally appears earlier than among men, indeed, from twenty to thirty years of age. The rich are more subject to insanity, in proportion, than the poor.